PATENT SPECIFICATION

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COMPLETE SPECIFICATION

DRAWINGS ATTACHED

Improvements relating to a Waveguide Switch

We, W H. SANDERS (ELECTRONICS) LIMITED, a Company registered under the laws of Great Britain, of Gunnels Wood Road, Stevenage, Hertfordshire do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a waveguide switch of the type (hereinafter referred to as "the type specified") comprising a rotor disposed as a close rotational fit within a stator, the stator being formed with at least three ports disposed in the same radial plane and the rotor being formed with at least one passage capable of placing selected ones of said ports in communication with one another to provide a signal path.

Usually such switches comprise a cylindrical stator formed with radially extending ports and a rotor formed with at least one transverse passage so that upon appropriate rotation of the rotor the passage constitutes a signal path between selected ones of the pots. It is necessary to ensure that there should be a high degree of isolation, at microwave frequencies between the particular signal path selected and the remaining switch ports. Although accurate machining of the rotor and stator can achieve isolations of about 60 dbs. it has, in the past, been customary to incorporate waveguide chokes in order to improve this figure. Such chokes are difficult to fabricate and increase the complexity and cost of the switch.

It is therefore an object of the present invention to provide an improved waveguide switch of the type specified which is simple and inexpensive to construct and yet provides high isolation at microwave frequencies between ports.

According to the present invention there is provided a waveguide switch of the type specified in which the whole or part of the area of the adjoining surfaces of the rotor and the stator except in the area immediately adjoining the signal path is provided by microwave absorbing material. Preferably each end of the or each passage or the inner ends of all the ports are surrounded by annuli of said material.

In a preferred form of the invention two annuli of microwave absorbing material are respectively disposed around each end of the or each passage. The annuli may be joined to provide a pair of circumferentially extending axially spaced annuli on the rotor. The circumferentially extending annuli may be joined together by microwave absorbing material between the ends of the or each passage.

The annuli may be of any suitable microwave absorbing material but it has been found that cold setting unsaturated polyester resin loaded with particles of carbonyl iron is particularly effective. This material is pourable in its plastics state and sets with a hard surface readily capable of being machined. This material is preferably cast into grooves formed in the surface of the rotor.

One embodiment of the present invention will now be described by way of example with reference to the accompanying drawing, in which:—

Fig. 1 is an elevational view of a rotor and

Fig. 2 is a section on the line II-II of Fig. 1 and including the stator.

Referring to the drawing, the switch comprises a hollow cylindrical stator 1 of circular cross-sectional shape having three flats 2, 3 and 4 formed at 120° intervals on its outer surface at corresponding positions approximately mid-way of the length of the

[Price 4s. 6d.]

stator. Three rectangular ports 5, 6, and 7 are formed through the stator wall respectively centrally of each of the flats.

A cylindrical rotor 8 is disposed as a close fit within the stator and is provided with trunnions 9 held between suitable bearings (not shown) in the stator to be rotatable therein. The rotor 8 is formed with a single transversely extending curved passage 10 extending between a pair of openings 11 and 12 in its periphery 13 which are spaced apart 120°. The openings are so disposed that when the rotor is mounted within the stator it may be rotated to cause the passage 10 to connect between any pair of ports 5, 6, 7, in the stator and to provide a smoothly curved signal path between the selected ports.

The outer periphery 13 of the rotor 8 is formed with rectangular annular grooves 14 respectively spaced from and completely surrounding each end of the passage 10. The grooves are joined and further extended to provide a pair of circumferential grooves 15 encircling the rotor adjacent each end thereof. These grooves are joined axially of the rotor at 16 on that part of the periphery of the rotor registering with the inoperative one of the ports 5, 6, 7, in the stator 1. All the grooves are filled with a microwave absorbing material 17 and it has been found that a suitable material is a cold setting unsaturated polyester resin loaded with particles of carbonyl iron. This material sets with a sufficiently hard surface to permit accurate machining so that the outer surface of the material cast into the grooves may be accurately machined with the outer periphery 13 of the rotor to be flush with the latter.

It has been found that with the construction above described isolation figures in excess of 100 dbs. over a band of 8.2 Gc/s to 12.4 Gc/s can be obtained. In addition the microwave absorbing material in the part 16 of the grooves provides a reasonably matched load in the stator port not being used at any one time whereas in previous constructions of waveguide switch the unused port has in effect been short circuited.

Although, as described the absorbing material is located on the rotor it could be disposed around the inner surface of the stator.

In addition although it has been found desirable to provide unbroken annuli at each end of the signal path it has been found that a useful leakage decrease can be provided by strips of microwave absorbing material extending axially of the rotor at each end of the signal path.

Furthermore although separated axially extending grooves 14 are formed between the openings 11 and 12 it will be appreciated that a single groove of greater circumferential dimension could be provided.

In all cases it is essential for optimum results to ensure that the absorbing material is spaced from the signal path to preclude attenuation of wanted signals in the path.

WHAT WE CLAIM IS:—

1. A waveguide switch of the type specified in which the whole or part of the area of the adjoining surfaces of the rotor and the stator except in the area immediately adjoining the signal path is provided by microwave absorbing material.

2. A switch according to claim 1 in which each end of the or each passage or the inner ends of all the ports are surrounded by annuli of said material.

3. A switch according to claim 1 in which two annuli of microwave absorbing material are respectively disposed around each end of the or each passage.

4. A switch according to claim 3 in which the annuli are joined to provide a pair of circumferentially extending axially spaced annuli on the rotor.

5. A switch according to claim 4 in which the circumferentially extending annuli are joined together by microwave absorbing material between the ends of the or each passage.

6. A switch according to any one of claims 2 to 5 in which the annuli are of cold setting unsaturated polyester resin loaded with particles of carbonyl iron.

7. A waveguide switch of the type specified substantially as herein described.

8. A waveguide switch of the type specified substantially as herein described with reference to Figs. 1 and 2 of the accompanying drawing.

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1,034,802 COMPLETE SPECIFICATION
1 SHEET

This drawing is a reproduction of the Original on a reduced scale.

Fig. 1.

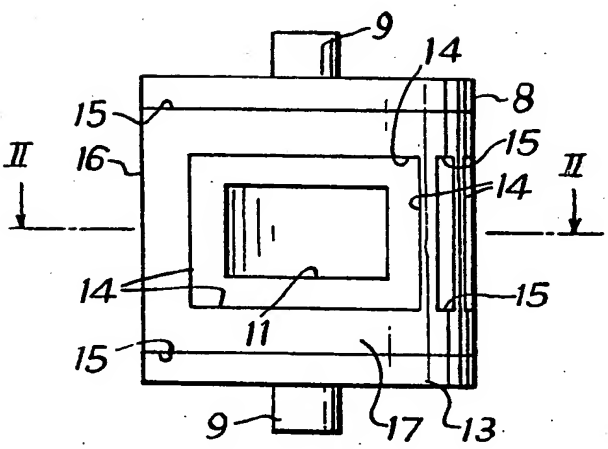

Fig. 2.